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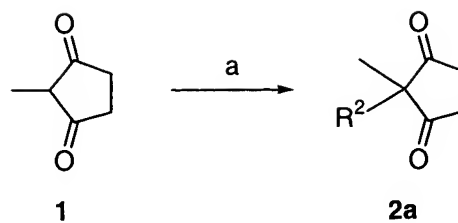
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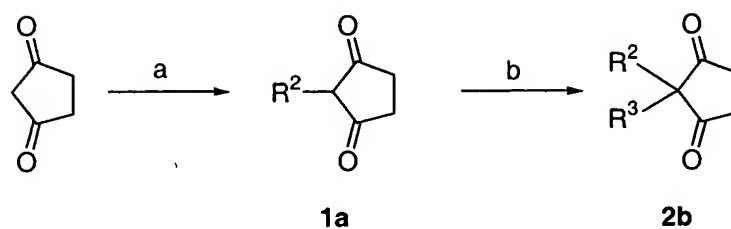
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**Scheme 1**

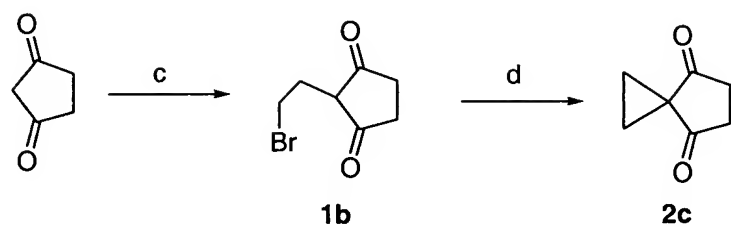
Equation 1



Equation 2

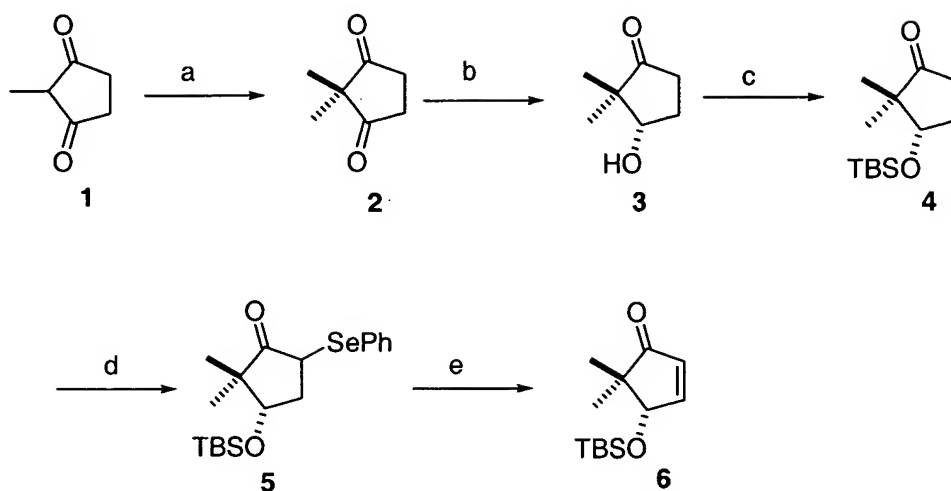


Equation 3



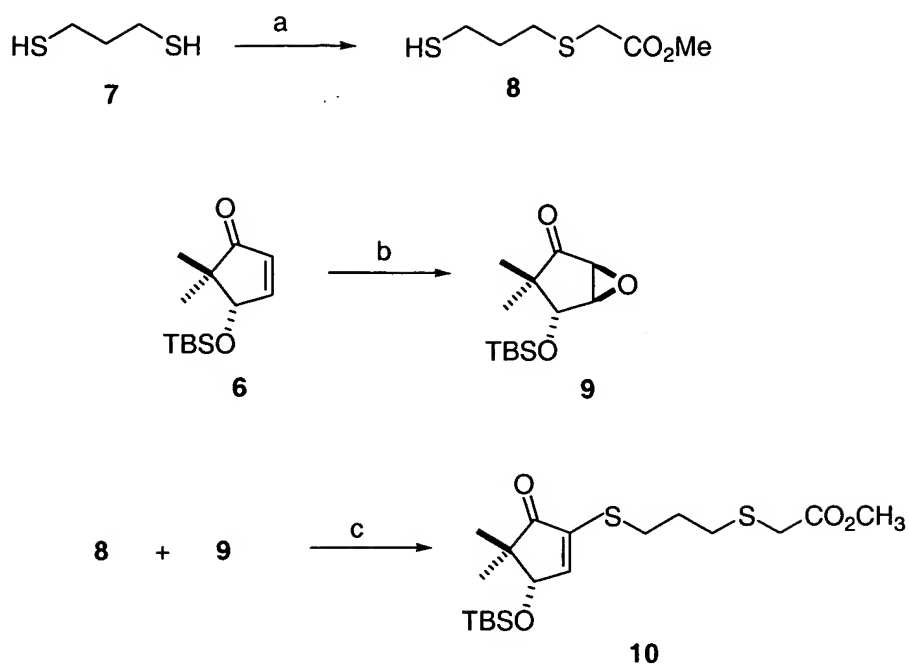
(a) KOH,  $I-R^2$ , dioxane/ $H_2O$ ; (b) KOH,  $I-R^3$ , dioxane/ $H_2O$ ; (c) KOH, 1,2-dibromoethane, dioxane/ $H_2O$ ; (d) KOH, dioxane/ $H_2O$ .

**Scheme 2**



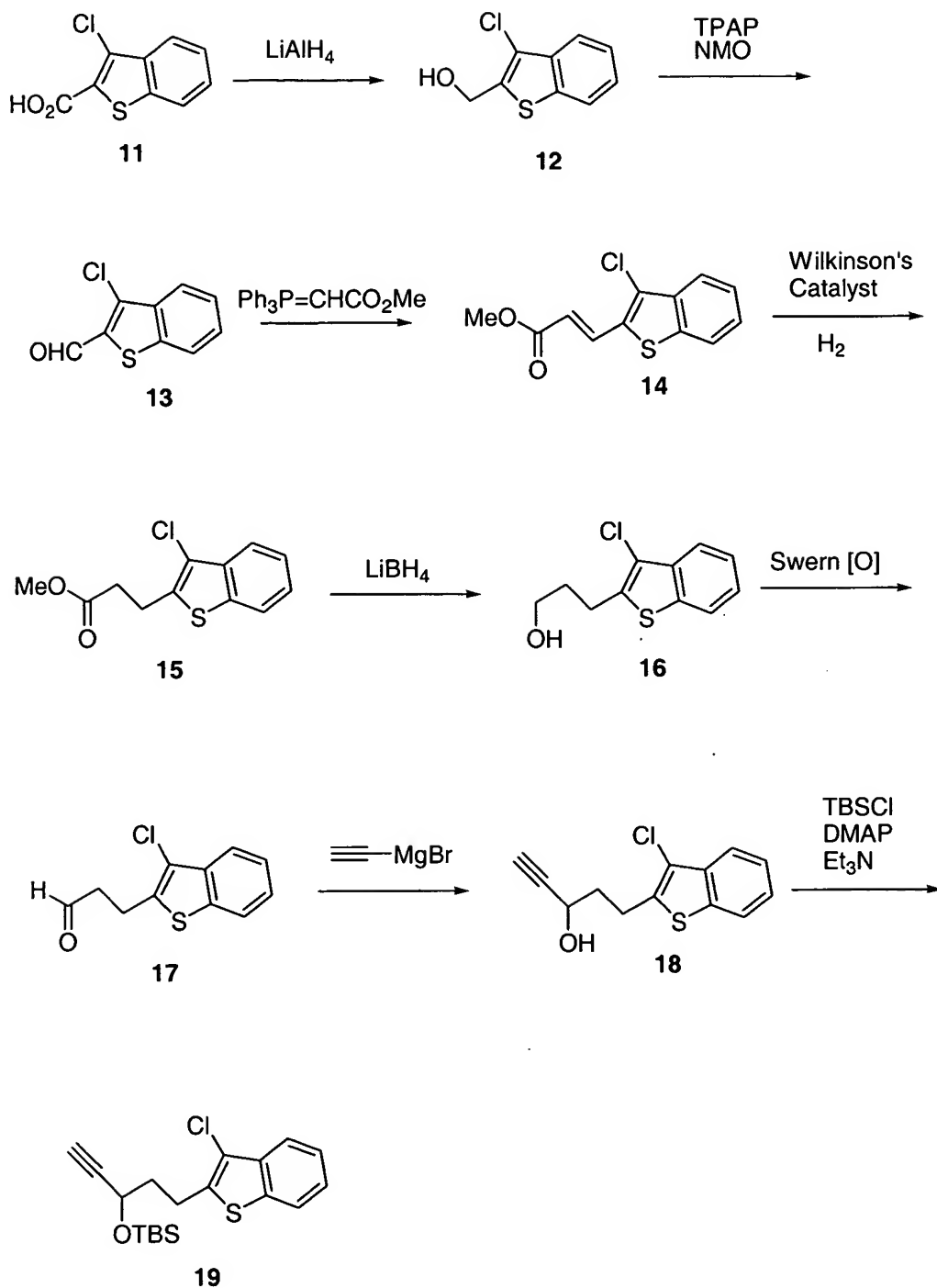
(a) KOH, MeI, dioxane/H<sub>2</sub>O; (b) Baker's Yeast, D-glucose, H<sub>2</sub>O; (c) TBSOTf, 2,6-lutidine, CH<sub>2</sub>Cl<sub>2</sub>; (d) LDA, THF; PhSeCl; (e) 30% H<sub>2</sub>O<sub>2</sub>, CH<sub>2</sub>Cl<sub>2</sub>.

**Scheme 3**

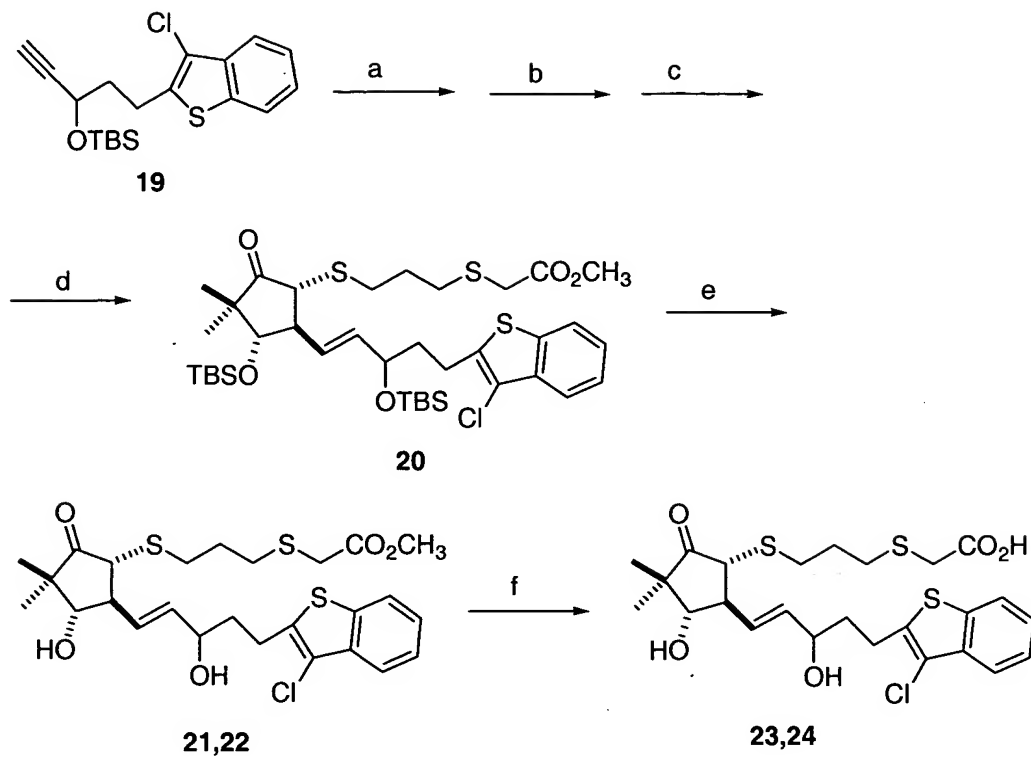


(a) NaH, BrCH<sub>2</sub>CO<sub>2</sub>CH<sub>3</sub>; (b) H<sub>2</sub>O<sub>2</sub>, NaOH, MeOH; (c) basic Alumina, CH<sub>2</sub>Cl<sub>2</sub>.

**Scheme 4**

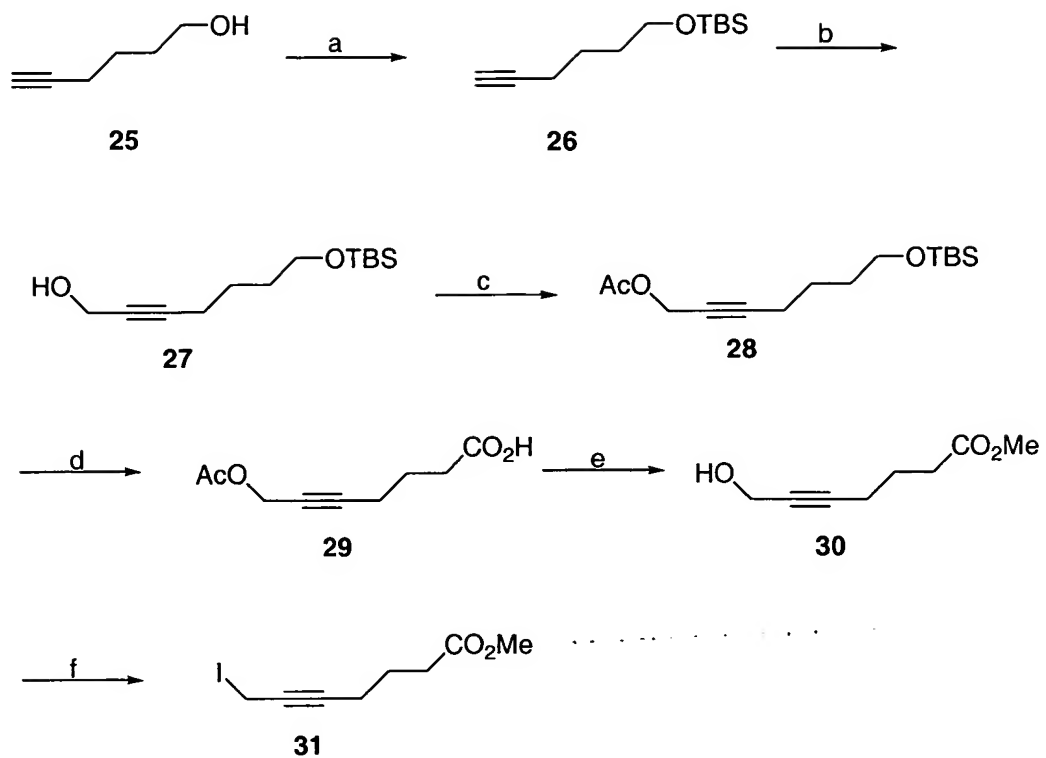


**Scheme 5**



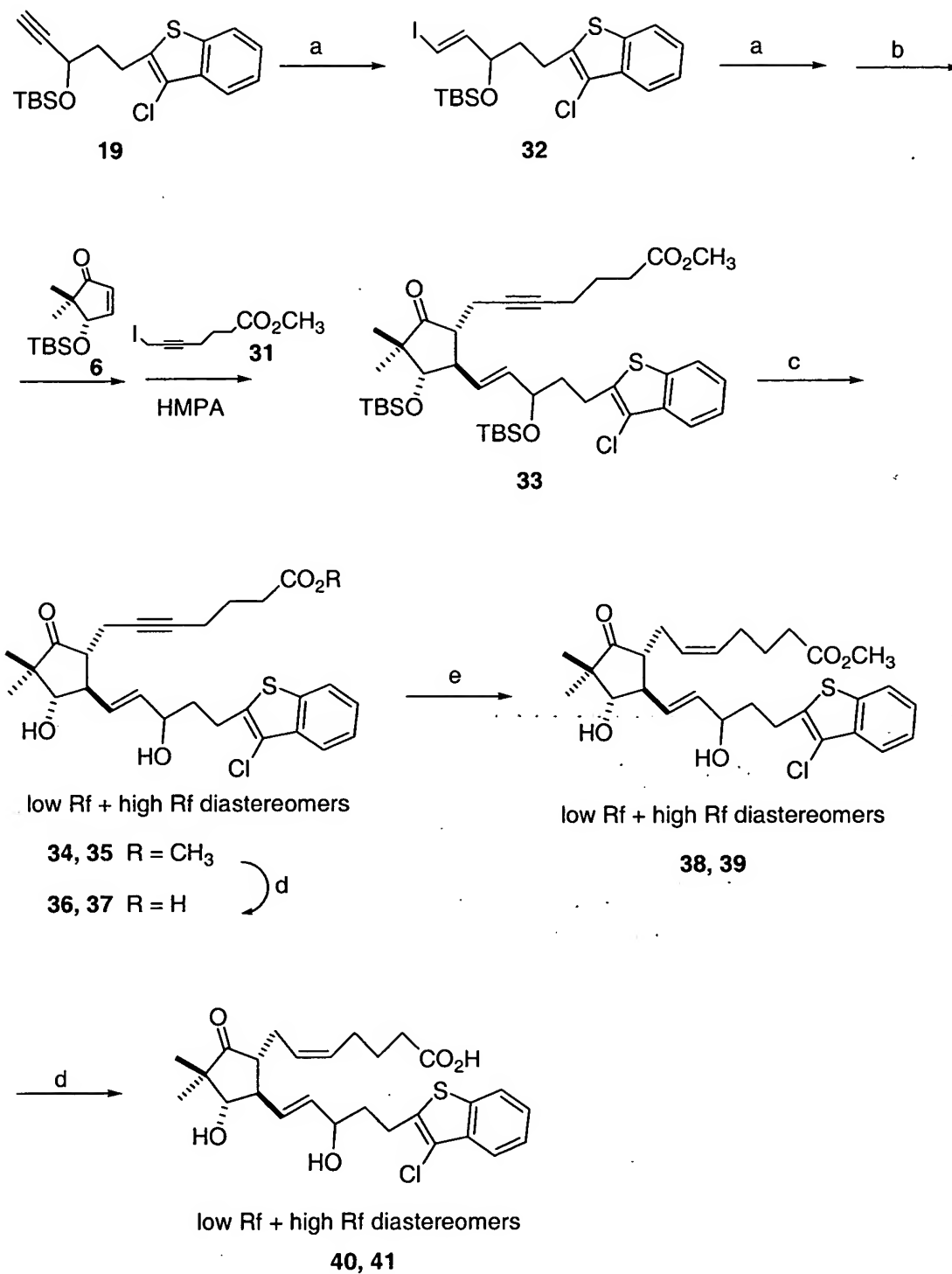
(a)  $\text{Cp}_2\text{ZrHCl}$ , THF; (b) MeLi,  $\text{Et}_2\text{O}$  -78 °C; (c) lithium 2-thienecyanocuprate;  
 (d) enone **10**, THF -78 °C; (e) HF-pyridine,  $\text{CH}_3\text{CN}$ ; separate diastereomers  
 (f) rabbit liver esterase, phosphate buffer,  $\text{CH}_3\text{CN}$ .

Scheme 6



(a) TBSCl, etc.; (b) *n*-BuLi; DMF; (c) Ac<sub>2</sub>O, pyridine; (d) Jones oxidation; (e) MeOH, AcCl; (f) PPh<sub>3</sub>, I<sub>2</sub>, imidazole, CH<sub>2</sub>Cl<sub>2</sub>.

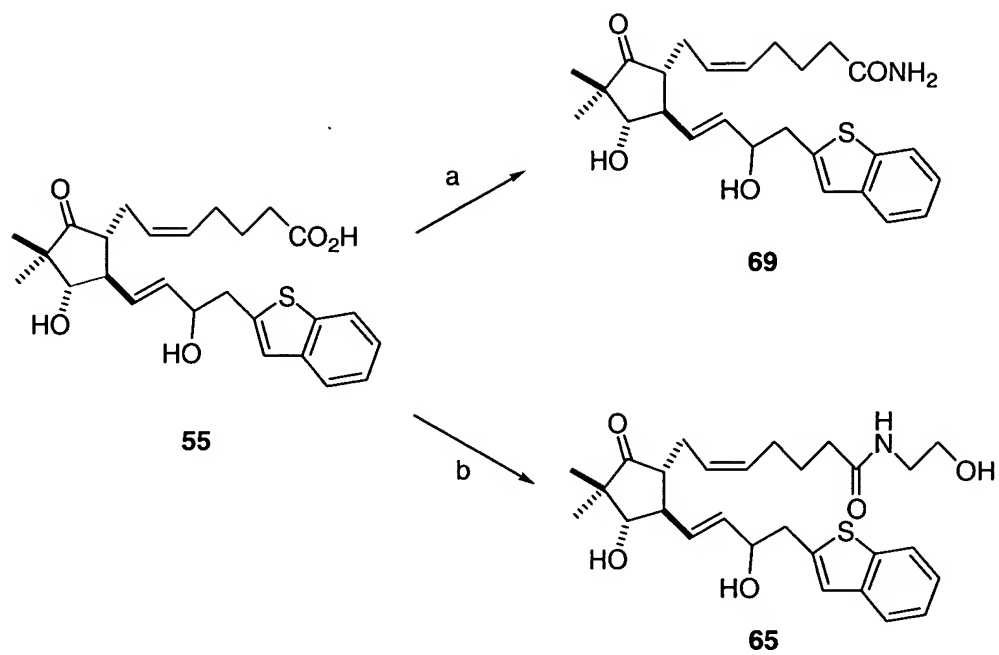
**Scheme 7**



(a) *t*-BuLi, THF -78 °C; (b) Me<sub>2</sub>Zn; (c) HF-pyridine, CH<sub>3</sub>CN; separate diastereomers; (d) rabbit liver esterase, pH 7.2 phosphate buffer, CH<sub>3</sub>CN; (e) NiCl<sub>2</sub>, NaBH<sub>4</sub>, ethylenediamine, H<sub>2</sub>, THF;



**Scheme 8**



(a) ClCO<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>, Et<sub>3</sub>N, CH<sub>2</sub>Cl<sub>2</sub>; NH<sub>4</sub>OH (aq);

(b) EDCI, N-hydroxysuccinimide, H<sub>2</sub>NCH<sub>2</sub>CH<sub>2</sub>OH, DMF.